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STABILITY EFFICIENCY OF STABLE HETEROGENEOUS USING SEP FOR WSN

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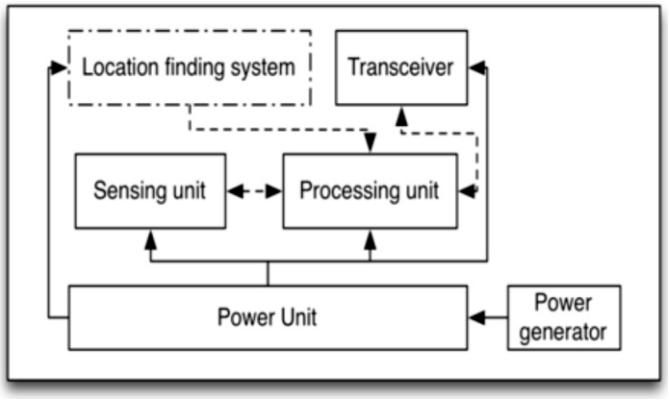
ABSTRACT

In this paper we define the wireless sensor network with heterogeneous nodes and some of these nodes become the cluster head and these cluster head transmit the data by using sink. In this paper we propose enhance the stability of heterogeneous nodes by using stable election protocol. In this network we break the network into two zones one is normal zone and another is advance zone. System installs a base station in the network. Under normal zone nodes are communicate directly and in the advance zone nodes are communicate by using cluster head.

1. INTRODUCTION:

Wireless sensor network is the technology with huge numbers of applications. Wireless sensor network used in the information sensing, environmental, military application. Wireless sensor network is huge numbers of tiny nodes with less battery life. A wireless sensor device divides into five main components these components are location finding system, transceiver, sensing unit, processing unit power unit and power generator.

a) Sensing unit: The sensing unit is the important component of the wireless sensor device. This sensor unit gathering the data from the physical world. Each sensor unit is responsible for gathering information of a certain type, such as temperature, humidity, or light, and is usually composed of two subunits: a sensor and an analog to- digital converter (ADC). The analog signals produced by the sensor based on the observed phenomenon are converted to digital signals by the ADC, and then fed into the processing unit.



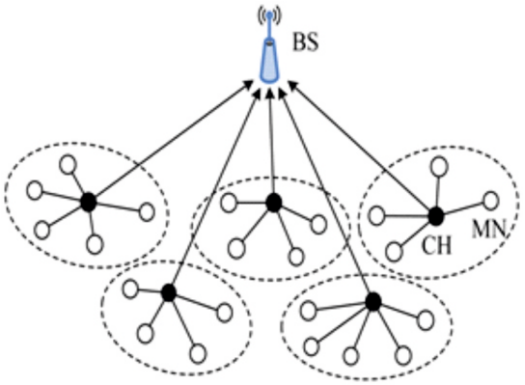
b) Processing unit: Processing unit is the work as a controller in the wireless sensor device. The processor executes different tasks and controls the functionality of other components. The required services for the processing unit are pre-programmed and loaded into the processor of sensor nodes. The processor's rate for the energy utilization is varies depending upon the functionality of the nodes. The variation in the performance of the processor is identified by the evaluating factors like processing speed, data rate, memory and peripherals supported by the processor [2]

c) Transceiver unit: when two nodes are communicated in the wireless sensor network then this communication due to transceiver. So this is an important component of the wireless sensor device. This transceiver converts the bits into the radio frequency and communication start among the nodes.

d) Power Unit: Power units provide the energy to the nodes in the wireless network. Nodes are communicated with each other and these nodes have very less energy so they required another source for energy. So power unit provide the energy of these nodes.

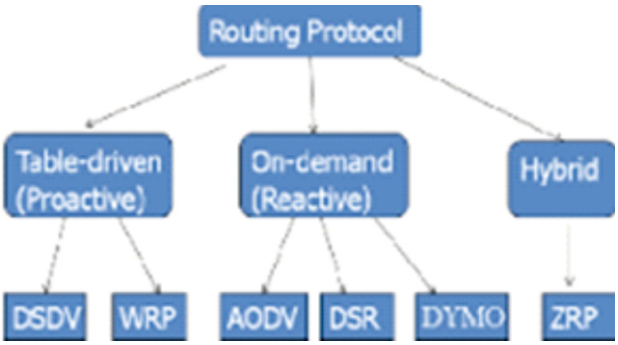
e) Power Generator: While battery power is mostly used in sensor nodes, an additional power can be used for applications where longer Network lifetime is essential. For outdoor applications, solar cells are used to generate power. Similarly, energy scavenging techniques for thermal, kinetic, and vibration energy can also be used [3].

Heterogeneous nodes are used in wireless sensor network for communicating nodes. Wireless network divides into zones and each zone has its own cluster. Cluster is used to communicate with another zone of cluster. In the Formation cluster communication cluster nodes are communicate with base station and transfer the data to member nodes of their zone.



2. NETWORK PROTOCOL

Sensor network protocol divides into three major parts:



a) Reactive Protocol
b) Proactive Protocol
c) Hybrid Protocol

Proactive Protocol:- In the Proactive protocol nodes are communicate among one another. In the proactive protocol routing table is exits. When a source node wants to communicate with destination node and source node does not have the path of destination node then source node find the path in the source node routing table. Proactive protocol has further different types DSDV etc.

Reactive Protocol:- Reactive protocol has the cache instead of routing table. In the reactive protocol nodes are directly communicate with each other. AODV and DSR are the types of the Reactive or on-demand routing protocol.

Hybrid Protocol:- Hybrid protocol is the combination of both the above protocols. In the hybrid protocol two zones are formed one is called intra-zone and another is inter-zone. ZRP (zone routing protocol) is type of hybrid protocol.

3. BASED ON THE WHETHER THE PROTOCOLS ARE DIVIDES INTO DESTINATION AND SOURCE TYPES:

1. **Source-initiated protocol:-** In the source initiated protocol data is send by source node is called as source-initiated protocol. I.e. initiate path setup from source node.

2. **Destination-initiated protocol:-** In the destination initiated protocol data sending starts from the destination node. I.e. initiate path setup from destination node.

4. CLASSIFIED INTO TWO TYPES BASED ON THE ARCHITECTURE OF ROUTING PROTOCOL

1. **Hierarchal routing:-** when nodes have different energy level in the network hierarchal routing is used. In this protocol different nodes are grouped into one cluster and cluster head communicate with nodes. Clustering has few benefits like scalability, easy to used, energy efficiency etc.

2. **Flat routing:-** There is no clustering in the flat routing. In this routing all nodes treats equally if one node send to some data to another node then this node is responsible for sending the data.

5. RELATED WORK:

There are different types of protocols:-

1. LEACH (Low Energy Adaptive Clustering Hierarchy) LEACH [4] is one of the most popular clustering algorithms. The main idea behind leach is to form clusters based upon the signal strength of the sensors. One node chosen as a cluster head (CH) from numbers of node in the network. (CH) and a node is assigning to the CH based upon the signal power received by that node from the CH. In the network cluster head have to work more than the normal nodes hence they required more energy but they doesn't have and moreover they dead vastly. In order to maintain a stable network, CHs keep on rotating, in every round. So, a node which had turn into CH may not get an chance to turn into CH again before a set interval of time. A node can become the cluster head for the current round if its value is less than the threshold T(n) where T(n) is given by:

$$T(n) = \begin{cases} \dfrac{P}{1 - P * (r \bmod \frac{1}{P})} & \text{if } n \in G \\ 0 & \text{otherwise} \end{cases}$$

P is the percentage of cluster heads, r is the rth round, G is the set of nodes which are not cluster heads in the last 1/P rounds.

Advantages:

- LEACH is completely scattered. LEACH does not need the control information from the base station, and do not need knowledge of the global network in order for LEACH to operate.

- LEACH communication energy by 8 times reduces as compare to direct transmission and minimum transmission energy routing.

Disadvantage:

The cluster heads are by chance selected using a random number and not on the basis of residual energy which is the biggest disadvantage of LEACH. The set up phase does not guarantee that the nodes are evenly distributed among the cluster heads. LEACH protocol may lead to unbalanced energy distribution due to random Selection of cluster head [5]. LEACH assumes that all sensor nodes have sufficient power to reach the base station as in LEACH algorithm, in the given formula there is no energy factor included, this would restrict the nodes having energy constraint [2].

6. PROPOSED WORK

Stable Election Protocol (SEP):- We define the stable election protocol with numbers of heterogeneous nodes, in this protocol we divide the network into two different zone one is normal zone and another is advance zone, in the normal zone nodes are communicating directly among one another is called normal node and denoted by (α). In the advance zone nodes are communicating with the help of cluster head, in the advance zone cluster head exist but not in normal zone and these nodes is called advance nodes denoted by (*m*).

In order to extend the stable region, SEP attempts to continue the constraint of fit balanced energy utilization. Intuitively, advanced nodes have to turn into cluster heads more often as compare the normal nodes, which is equal to a fairness constraint on energy consumption. Note that the new heterogeneous situation (with advanced and normal nodes) has no cause on the spatial density of the network so the apriori situation of *popt*, from does not change. On the second side, the energy of the total system changed. Let *Eo* is the initial energy of each normal node. Corresponding the energy of each advanced node will be $Eo \cdot (1 + \alpha)$. And the total energy for the new heterogeneous setting is equal to: $n.(1-m).E_o + n.m.E_o.(1+\alpha) = n.E_o(1+\alpha.m)$

So, the total energy of the system is increased by $1+\alpha \cdot m$ times. The first improvement to the existing LEACH is to increase the epoch of the sensor network in proportion to the energy increment. In order to optimize the stable region of the system, the new epoch must become equal to 1

$Popt \cdot (1 + \alpha \cdot m)$ because the system has $\alpha \cdot m$ times more energy and virtually $\alpha \cdot m$ more nodes (with the Same energy as the normal nodes).We can now increase the stable region of the sensor network by $1+\alpha \cdot m$ times, if

(i) Each normal node becomes a cluster head once every 1 $Popt \cdot (1+\alpha \cdot m)$ rounds per epoch.

(ii) Each advanced node becomes a cluster head exactly $1+\alpha$ times every 1 $Popt \cdot (1+\alpha \cdot m)$ *rounds* per epoch.

(iii) The average number of cluster heads per round per epoch is equal to $n \times popt$ (the spatial density does not change). Constraint (ii) is very strict—If at the end of each epoch the number of times that an advanced sensor has become a cluster head is not equal to $1 + \alpha$ then the energy is not well distributed and the average number of cluster heads per round per epoch will be less than $n \times popt$. This problem can be reduced to a problem of optimal threshold $T(s)$ setting, with the constraint that each node has to become a cluster head as many times as its initial energy divided by the energy of a normal node.

7. PERFORMANCE MEASURES:-

We define here the measures we use in this paper to evaluate the performance of clustering protocols.

- ***Stability Period:*** Stability Period is time interval between start from first nodes to the death of the first nodes. We denote this period as "stable Period".

- ***Instability Period:*** is the time distance from the death of the first node until the death of the last sensor node. We also denote to this period as "unstable region."

- ***Network lifetime:*** is the time distance from the start of operations (of the sensor network) until the death of the last alive node.

- ***Number of cluster heads per round:*** This on the spot measure reflects the number of nodes which would send directly to the sink information aggregate from their cluster members.

- ***Number of alive (total, advanced and normal) nodes per round:*** This on the spot measure reflects the total number of nodes and that of each type that has not yet expended all of their energy.

- ***Throughput:*** We calculate the total rate of data sent over the network, the rate of data sent from cluster heads to the sink as well as the rate of data sent from the nodes to their cluster heads.

8. SIMULATION:

In the simulation we are using a 100*100 region for simulation having 50 sensor nodes location in the sensor filed in not predefined. The probability of advanced nodes is kept as 0.1, so the number of advanced nodes is 20. 4000 is the size of the packet we are using in this sensor field. A number of parameter taken for this simulation describe in the table below:-

Parameters	Value
Eelec	50Nj/bit
Size of node Packet	4000
Numbers of node	50
Network Size	100*100
Base Station Location	50*50
Eo	0.5J
A	1
Platform	Matlab2009a

9. RESULTS:

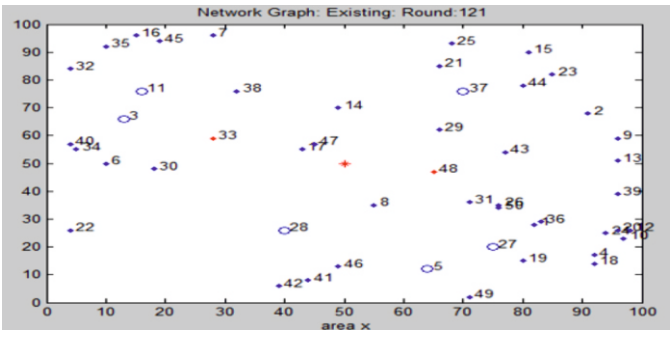


Figure 1

This graph shows the network simulation with base station at the centre.

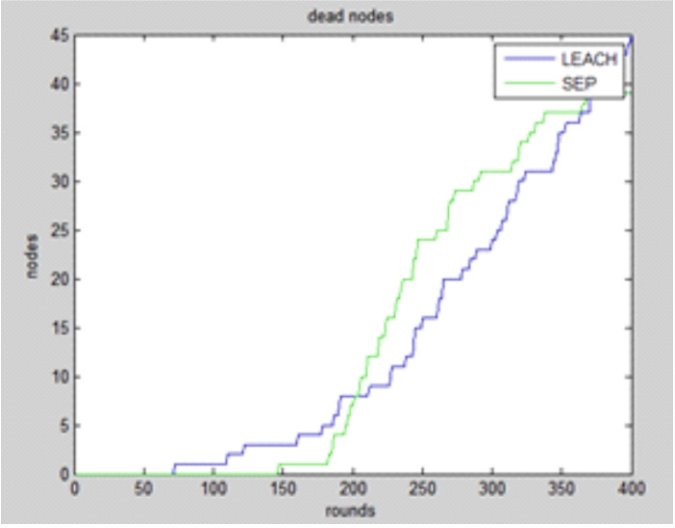


Figure 2

This graph shows the number of dead node between LEACH and SEP with area of 100*100 and 50 nodes.

LEACH nodes dead at 74th round and SEP nodes dead at 147th round.

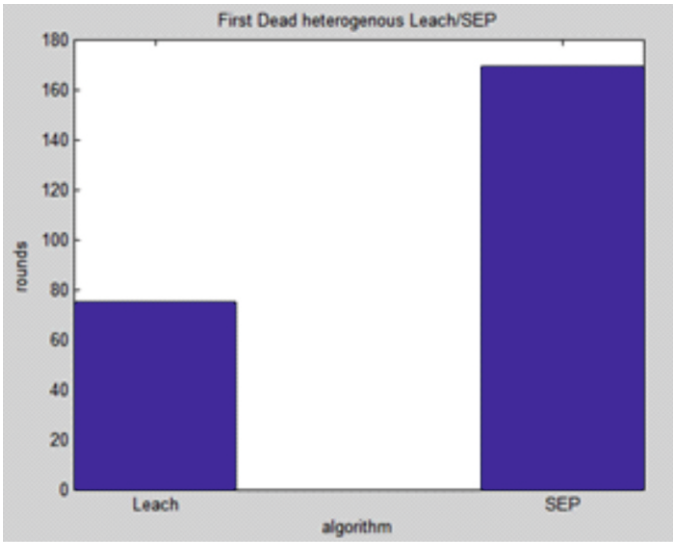


Figure 3

This graph shows the stability between LEACH and SEP protocol.

10. COMPARISON BETWEEN LEACH AND SEP:

Performance Criteria	LEACH	SEP
Heterogeneity Level	Not Present	Two
Cluster Stability	Low	High
Energy Efficient	Low	High
Cluster head Selection Criterion	Based on initial and residual energy	Based on initial and residual energy
Network lifetime	Low	High
Network Stability	Low due to dead node maximize	High due to dead minimize
Alive node	In LEACH when area is small for transmit ion alive nodes are maximum.	Alive node stability is high is SEP as compare to LEACH.
Node Failure	Due to Network Load Node is High.	Due to higher efficient node, node failure is lower than LEACH.
Total data received by base station.	In initial rounds data received by base station is high and lower as area of network is increased.	High data received by base station due to high stability of advance node.

CONCLUSION:

In this paper we described about the wireless sensor network with heterogeneous nodes. We improved the stability period by using stable election protocol. We compare results with Leach protocol in the leach protocol nodes have the less energy which was not sufficient to use for complicated algorithm and by using stable election protocol we improved the stability period of the heterogeneous nodes. And proved stable election protocol is better than other exiting protocols.

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